

Remedial Investigation Summary

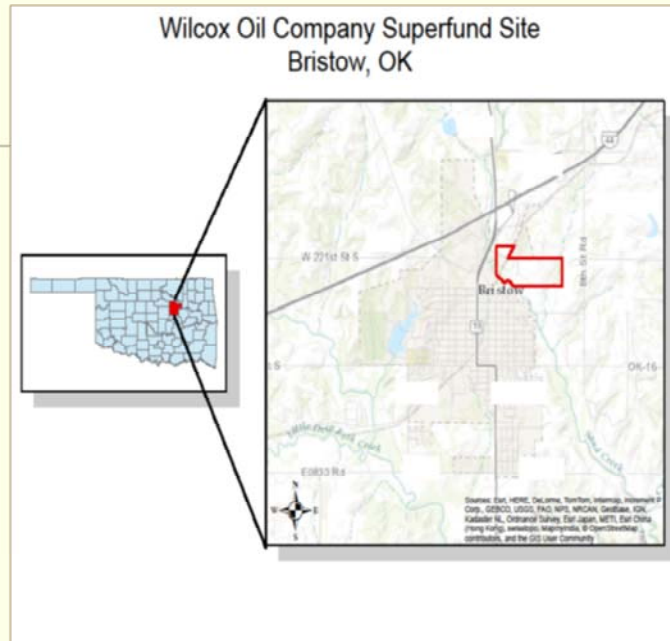
WILCOX OIL COMPANY, BRISTOW, OK

MARCH 15, 2018 [DRAFT 3-9-18]



The Site is situated NE of Bristow, Creek County, Oklahoma

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The site is located just **northeast** of central Oklahoma and just northeast of Bristow.

Site Background



1950s Aerial Photograph

Operation:
Oil Refinery

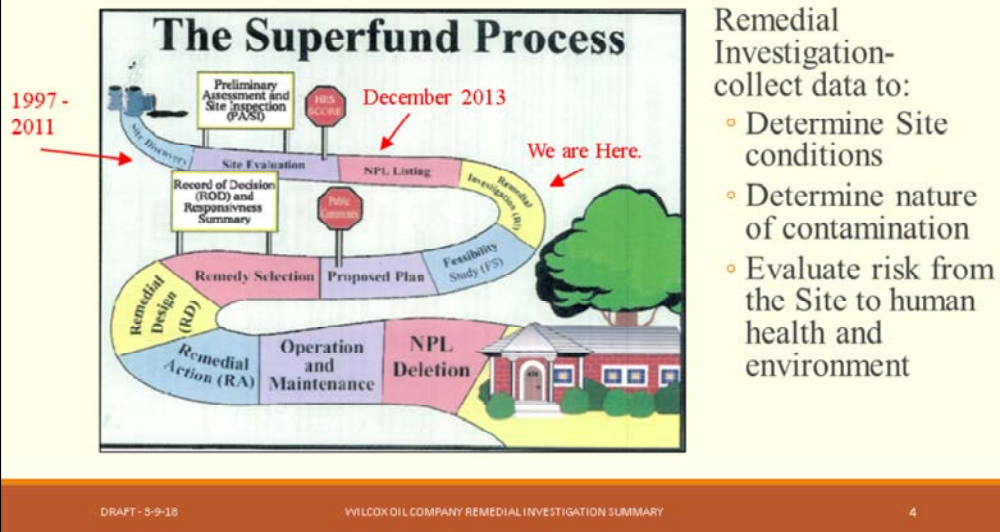
Activity Period:
1915 through 1963

Size:
about 140 to 150
acres

Listed:
December 12, 2013

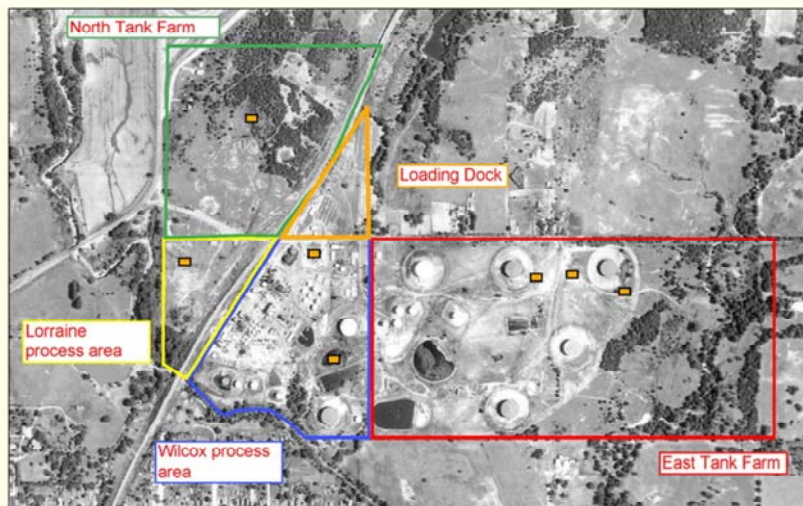
The site operated as an **Oil refinery** from about **1915 to 1963**. It is about **140 to 150** acres. This picture was taken sometime in the 1950s and shows the Wilcox plant during operation.

Superfund Process – Project Status



Summary of the Steps and notation of where the site is in the process.

Remedial Investigation – 5 Operation Areas



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The **site has been broken down into 5 areas based on operating history**. This is a 1956 aerial photograph that shows each of the site's operation areas.

Orange squares represent residences. 3 of which are currently occupied.

North Tank Farm: old Lorraine Refinery (~27 acres)

Lorraine Process Area (~9 acres) 42000 gal capacity tanks (~15-20 tanks)

Wilcox Process Area (~27 acres)

Loading Dock (~7 acres)

East Tank Farm: old Wilcox Refinery (~80 acres) 55,000barrel capacity tanks (10-15 tanks)

[illegible]

The Sanborn Insurance Maps indicate that the property contained about **80 storage tanks of various sizes**, a cooling pond, separation ponds, and around **10 or more buildings housing refinery operations**. The map also indicated that **crude oil, fuel oil, gas oil, distillate, kerosene**, and benzene (petroleum ether) were all stored on the property by the Lorraine /Wilcox Refining Company.

East Tank Farm: old Wilcox Refinery (~80 acres) 55,000barrel capacity tanks (10-15 tanks)

Wilcox Oil Company Open House

products, coke, sulfur compounds, and solvents. Waste management practices are unknown for this facility.

Lorraine: 1915 to 1937. Wilcox purchased Lorraine in 1937.

Wilcox: 1920 to 1963: upgraded from a 1000 barrel a day operation to a 4000 barrel a day operation in 1929.

Remedial Investigation – Phase Approach

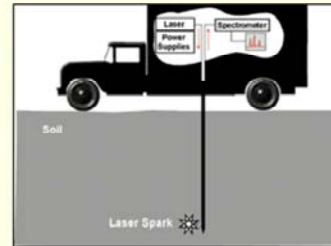
Phase 1 – Site Screen

- Residential Soil and Ground Water Sampling
- Fencing Waste Areas
- Geophysics
- Direct Sensing



Phase 2 – Data Collection over multiple field events

- Sources
- Soils
- Surface water
- Sediment
- Ground water
- Soil gas and indoor air



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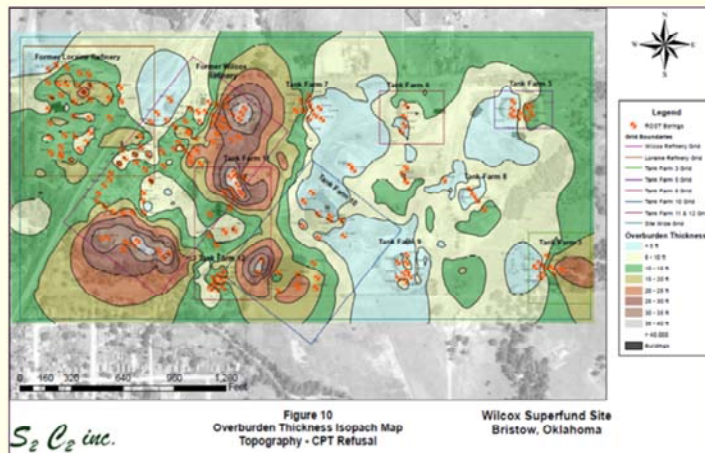
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2014/2015: ground water well sampling, soil sampling, fencing waste areas

2105/2018: 6 field events

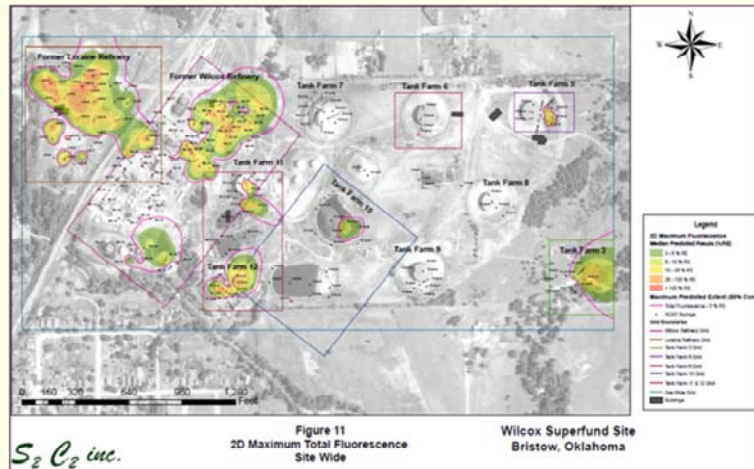
What have we learned thus far?

Remedial Investigation - Geophysics



Thickness overburden varies over the site from <5ft to greater than 35/40 ft.

Remedial Investigation – Direct Sensing



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With the **geology mapped** and the documentation of **refinery processes from Sanborn maps and aerial photographs**, we moved forward using a combination of **investigative tools: Rapid Optical Screening Tool , X-Ray fluorescence, and direct push technologies** to further delineate potential source areas.

The Rapid Optical Screening Tool used onsite was - **Light induced fluorescence** technology. Petroleum contains varying amounts of polyaromatic hydrocarbons or PAHs. Electrons in these molecules will absorb light energy and release that energy in the form of fluorescence. Using LIF, an **ultraviolet light is emitted** into the surrounding soils. The contaminants in the oil waste fluoresce when hit with the UV light and the location is recorded by the sensor. Based on the fluorescence signatures, we are **able to map potential source areas based on relative fluorescence and potential type of product present**.

Light induced fluorescence is a screening tool.

- It **does not map the lightest hydrocarbon** fractions or the heaviest.
- Information is associated with the **mid-range hydrocarbon fractions**. Note: the **refinery operations produce the lighter products** such as gasoline, while the storage tanks held crude oil direct from the fields. These **crude oils represent the heavier fraction**.
- **This technology does not quantitatively define** the contaminant detected but

rather focusses efforts in areas where contamination is most likely to be present.

- It does not provide information on **metals**.

Because the light induced fluorescence technology only provided **screening data**, **direct push technology was used to target areas for sampling** in an attempt to **identify and get some indication of the type and concentration of the contaminant** present.

Direct push technology was used to collect samples from the areas **providing the highest fluorescence signatures**. Results indicate the presence of **petroleum hydrocarbons in the gasoline, diesel, and oil ranges and PAHs**.

The **XRF** was used to **screen for metals**, with a focus on lead. Results indicate that the lead is highest in the process area where the fuel product was refined to remove excess sulfurs and other impurities.

During Phase 1, we were able to complete 200 LIF locations

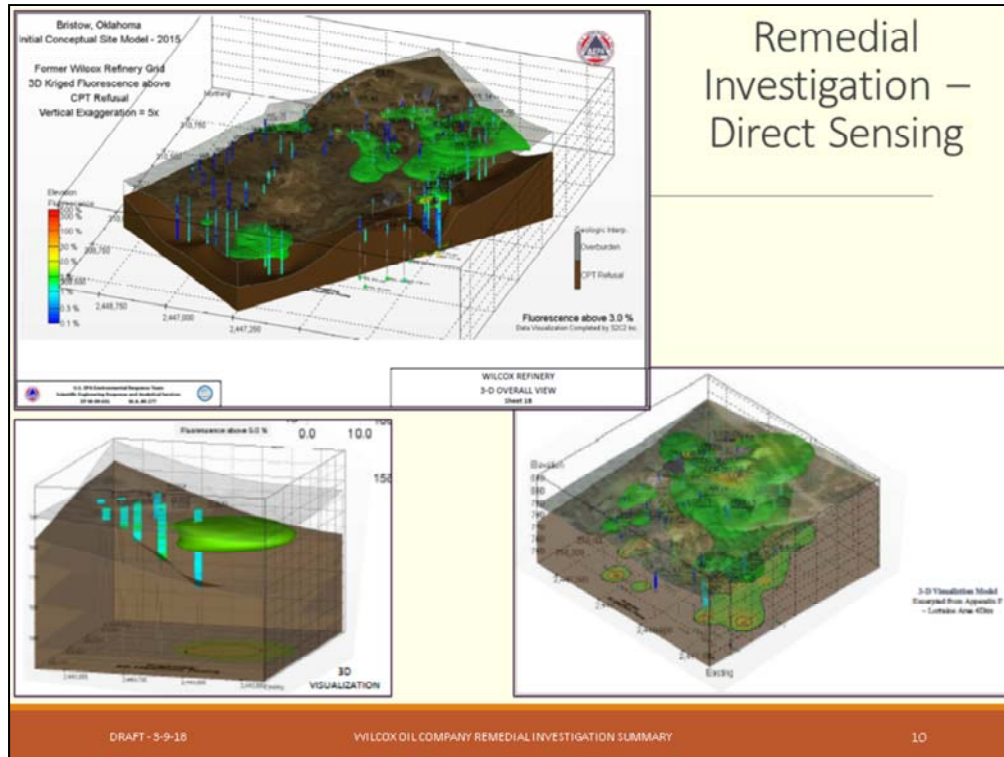
68 East Tank Farm

34 Lorraine

98 Wilcox

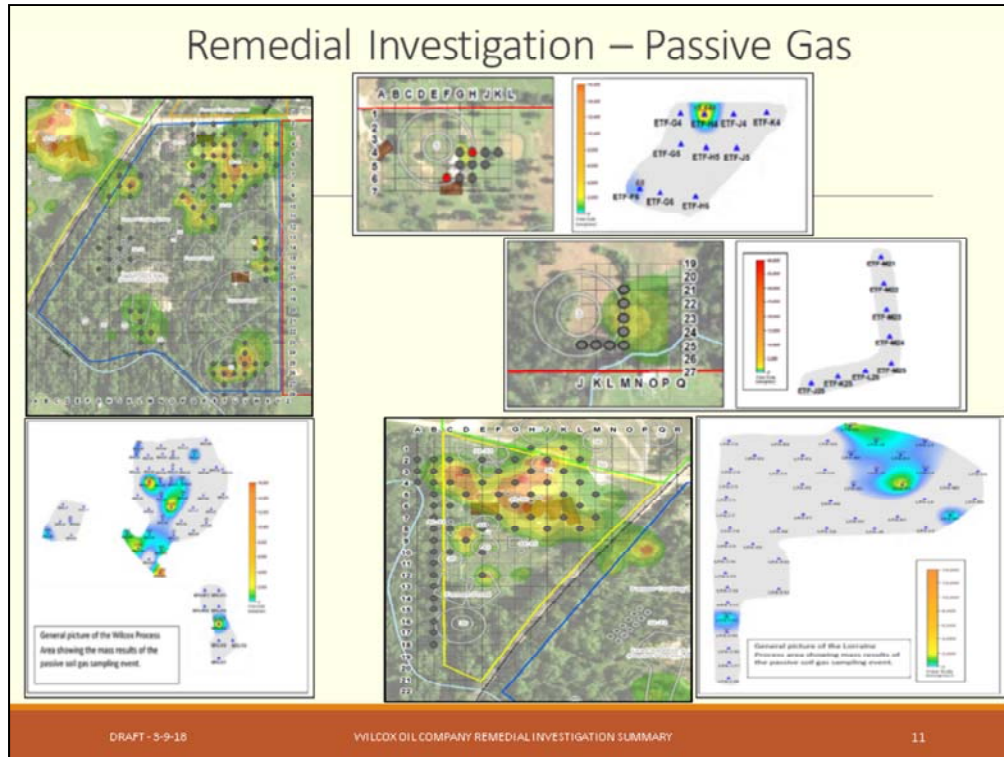
30 direct push locations

>100 XRF locations throughout



Not only did the **light induced fluorescence** provide us with a horizontal indication of potential waste material, but it also provided a **vertical indication or depth profile of the potential waste material**. Using that information, these **3D images** of the subsurface and the depth location of the potential waste material **were developed**.

As you can see from these maps, the potential waste material **ranges between 5 and 20 feet below ground surface**.



One of the media we are concerned about is **air**, specifically **vapors that can be produced from the waste source material**. We used **passive gas samplers** to **map** locations where **vapors** from the waste source material may be present. We also **sampled indoor air** within three buildings that are located within the former process area boundaries for Wilcox and Lorraine to **determine if these vapors are moving into the buildings where people can breath them**.

During Mobilization 1:

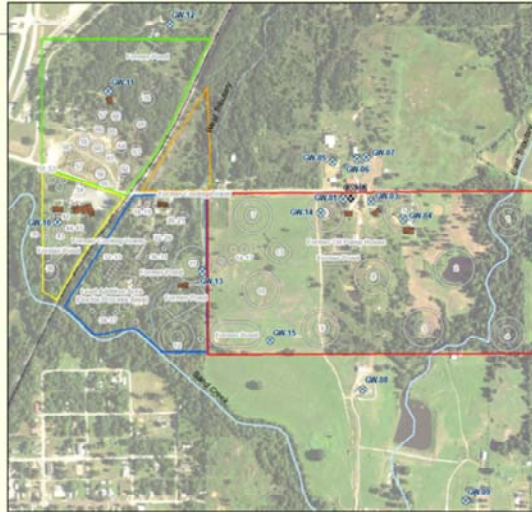
149 total locations

Based on the data, the source areas have the potential to create vapors. In addition, some indoor air data show that contaminants exceed the screening numbers. The primary indicator contaminants include dichlorobenzene, benzene, ethylbenzene, toluene, and Xylene.



Benzene, dichlorobenzene, ethylbenzene are the primary contaminants detected. Contaminants were detected above the screening levels indicating that the pathway requires further evaluation. These residential properties are currently vacant.

Remedial Investigation – Ground Water



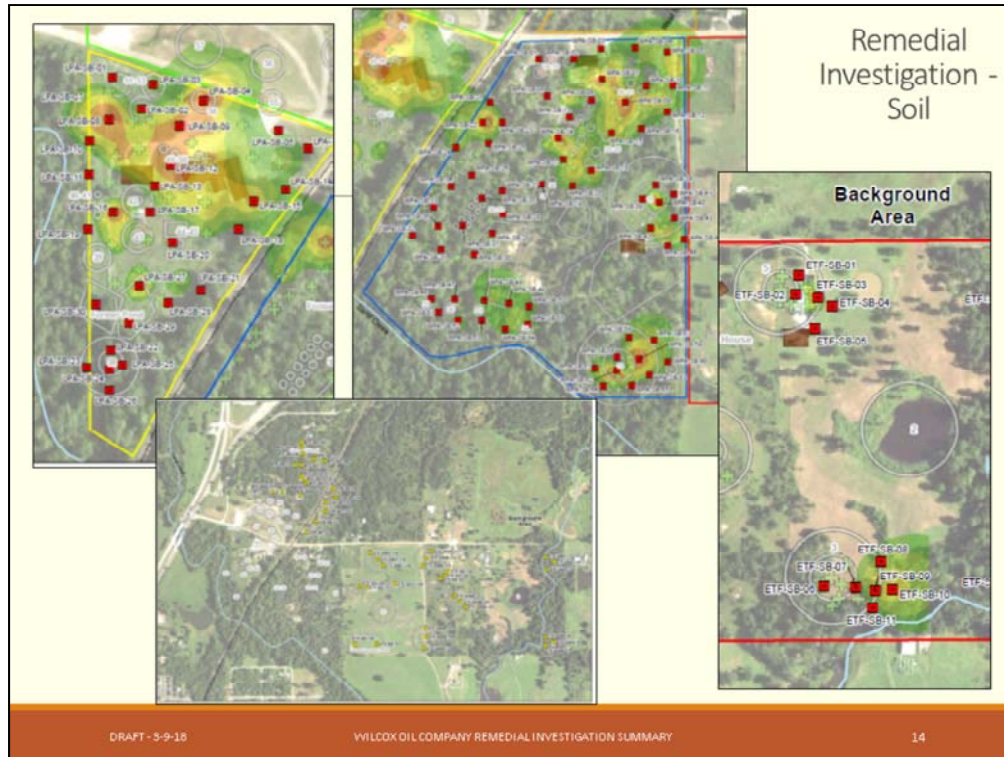
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Approximately 14 wells sampled.

Only one well was found to be unacceptable for drinking. This is the well located on the Lorraine process area and it has been abandoned.



The **dots** represent the **soil boring locations**. These locations were **selected based on the results** from the light induced fluorescence survey. These soil borings **will provide us with data** that will further our understanding of **what waste source material is present**, will refine the **horizontal and vertical extent**, and will **identify the contaminants that are present as well as their concentrations**.

In addition, the soil borings are located **along areas that may be in contact with Sand Creek**. These boring will provide data that will assist us in understanding whether **contamination is moving from the site and into the creek**.

Approximately ?? locations on Lorraine

Approximately ?? locations on Wilcox

Approximately ?? locations in the East Tank Farm

Remedial Investigation – Surface Water and Sediment



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In April 2017, 10 surface water samples from 10 locations along sand creek were collected. Data are below screening levels for humans. Further review related to ecological risks is needed.

As part of the continued site investigation activities: all other water bodies and ponds were sampled—surface water and sediment . Sediment samples were collected from Sand Creek as well as additional surface water.



Source material is defined as material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, to surface water, to air, or acts as a source for direct exposure (EPA, 1991). Site investigation activities identified two source materials, tank sludge/solids and the lead additive area solids

tank sludge/solid waste that can be either a contaminated oily tar-like viscous liquid and/or a black dry solid

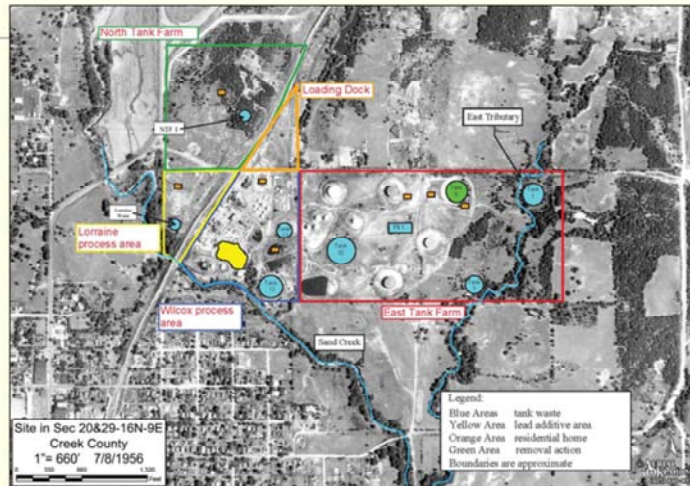
Lead additive area: silty sparkling sand and a white, salt-like substance

Remedial Investigation - Sources

Potential Early Action Proposal:

the agencies are working through and discussing the potential for proposing and early action to address these source areas

Proposal Release: target is Spring 2018.



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5 migration Pathways to the Creek

4 Residential Property exposure Pathways: direct and ingestion

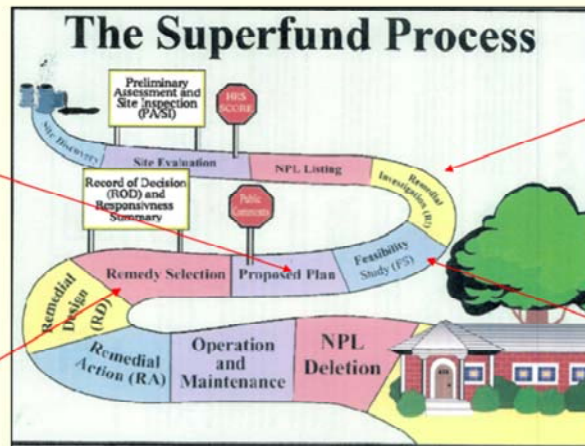
Risk Reduction: Human and Ecological receptors

Removal action Sept/Oct 2018: 1349 tons of tank source material removed

Future Work

Proposed Plan to present the preferred clean up option to the public (2020)

Record of Decision to establish the Site clean up (2021)



We are Here.

Feasibility Report to summarize clean up options (2020)

RI: work remains

- Data Gap Review
- Human Health and Ecological Risk Assessment
- Potential for Additional Sampling

Community Involvement

Site documents can be found at:

- Bristow Public Library
- Oklahoma Department of Environmental Quality

Web Resources

- ODEQ: www.deq.state.ok.us/lpdnew/index.htm
- U.S. EPA: <http://www.epa.gov/superfund/wilcox-oil>

Contacts

- | | |
|--|--------------|
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| ▫ ODEQ, Project Manager: Todd Downham | 405-702-5136 |
| ▫ EPA, Community Involvement: Bill Little | 214-665-8131 |
| ▫ EPA toll-free number | 800-533-5308 |
| ▫ George Pettigrew, ATSDR | 214-665-8361 |



Because these are distinct source areas, each area can be addressed independently; therefore, if all areas are not addressed under one action, then these areas can be prioritized based on potential exposure risk and addressed as funding is available. Source areas would be addressed in accordance with the selected source control action remedial alternative, albeit on different schedules.

8 Sources removed

5 Pathways to the Creek eliminated

Residential Property exposure Pathways eliminated

Risk Reduction: Human and Ecological

Consistent with Site Strategy

Potential for 80 of the 150 acres to be cleanup complete

Cost: \$5M and 34, 621 cubic yards